United States
Department of
Agriculture

Food Safety
and Inspection
Service

Science and
Technology

Domestic Residue Data Book National Residue Program 1994

FOOD SAFETY AND INSPECTION SERVICE

DOMESTIC RESIDUE DATA BOOK

NATIONAL RESIDUE PROGRAM

1994

FOOD SAFETY AND INSPECTION SERVICE
1994 NATIONAL RESIDUE PROGRAM
DOMESTIC RESIDUE DATA BOOK

TABLE OF CONTENTS

Introduction..... i -vii

1994 Domestic Residue Program Results

- Antibiotics..... 1
- Sulfonamides..... 4
- Arsenic..... 6
- Chlorinated Hydrocarbons & Organophosphates..... 7
- Halofuginone..... 9
- Ivermectin..... 9
- Levamisole..... 10
- Morantel Tartrate..... 11

Cumulative Total..... 12

Statistical Table..... 14

Appendix I: Residue Limits for Compounds Included in the 1994 Domestic Residue Program..... 15-21

Appendix II: 1994 Domestic Residue Program Results: Non-violative Laboratory Positive Results..... 23-28

Appendix III: 1994 Voluntary Inspection and Certification Program for Rabbits..... 29

INTRODUCTION

1994 DOMESTIC RESIDUE DATA BOOK

The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) is responsible for ensuring that USDA inspected meat and poultry products are safe, wholesome, free of adulterating residues, and accurately labeled. As part of this responsibility, FSIS conducts the National Residue Program (NRP) to help prevent the marketing of animals containing unacceptable (violative) residues from pesticides, animal drugs, or potentially hazardous chemicals. The NRP collects samples of meat and poultry products at domestic slaughter establishments under FSIS and State inspection authority. These samples are then analyzed for violative residue concentrations, either by one of the three FSIS technical service laboratories or by a laboratory under contract to FSIS. Violative residue concentrations - violations - are determined by reference to residue limits (tolerances or action levels) established by the Environmental Protection Agency (EPA) for pesticides and by the Food and Drug Administration (FDA) for animal drugs and environmental contaminants. It should be borne in mind that the multi-residue tests used in the program may detect some compounds that have tolerances but have little public health significance. See FSIS publication National Residue Program Plan [NRPP], 1994 edition.

The NRP activities reported here are of two types: monitoring and enforcement testing.

Monitoring

Monitoring involves the sampling of specified animal populations to provide information about the occurrence of residue violations on an annual, national basis. Compounds considered generally have established residue limits - tolerances or action levels. Residue limits pertinent to the 1994 NRP are listed in Appendix I.

Selection for monitoring is based on compound evaluations and the availability of laboratory methodology that is suitable for regulatory purposes. Monitoring information is obtained through a statistically-based random selection of specimens of normal appearing tissues from passed carcasses. Generally, for a specific slaughter class/compound pair, the number of specimens chosen provides a 95% probability of detecting at least one violation when one percent of the animal population is violative (see Table on page 14). In addition to profile information, the results are used to identify producers or other entities marketing animals with violative concentrations of residues. When such producers subsequently offer animals for slaughter the animals may be subjected to enforcement testing until compliance is demonstrated.

Exceptions to the number of specimens selected are made for minor slaughter classes and for major slaughter classes in which problems are suspected; smaller sample sizes may be used in the former case, larger sample sizes in the latter.

The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources. A total of 38,894 monitoring sample units were analyzed during 1994 from all classes of food-producing animals.

Enforcement Testing

Enforcement testing consists of the analysis of specimens obtained from individual animals or lots based on clinical signs or herd history. Testing is performed to detect individual animals with violative concentrations of residues. It is emphasized in problem (high prevalence) populations and used as a tool to prevent residues from entering the food supply. Testing frequently results from decisions by program employees based on regional guidelines and direct observations. It is also used to follow up on producers and others who have been identified as marketing animals with violative concentrations of residues. A total of 364,728 individual enforcement testing samples were analyzed in 1994.

In-plant Tests

In-plant tests are a key part of the NRP. They provide a rapid screening method to detect the presence of residues at the plant level.

SOS, for Sulfa-On-Site, was implemented in April 1988 to test swine urine for sulfonamide residues. SOS is used in many of the largest swine slaughtering facilities. Laboratory confirmation of violations is required.

CAST, for Calf Antibiotic and Sulfonamide Test, is used to test bob veal calves (under 150 pounds and less than three weeks old). CAST does not require laboratory confirmation of the result; any violation found with CAST results in immediate condemnation of the calf.

STOP, for Swab Test on Premises, was implemented in 1979 to detect the presence of antibiotic residues in kidney tissue. Originally for testing dairy cows, it is now used for a number of species. Laboratory confirmation is required before the animal carcass is condemned. Certain STOP-positive samples are tested for both antibiotics and sulfonamides; the sulfonamide violations are reported with the STOP antibiotic violations.

Confirmed STOP positive sample specimens with sulfonamide residues that have no established limits are considered violative in those slaughter classes in which they are not approved for use.

FAST, for Fast Antimicrobial Screen Test, quickly detects both antibiotic and sulfonamide drug residues in kidneys and livers and has proved to be

a suitable replacement for CAST and STOP. FAST was implemented in pilot plants in 1994.

INTERPRETATION OF TABLES:

Sample Analyses/Violations:

In the 1994 Residue Data Book, the main entries in the body of the table under compound or compound /class headings refer to analyses of sample units comprised of tissues from an animal or several birds from the same production lot. The "Specific Violative Residues" presented in smaller type below the table refer to the actual residues found.

The reader is cautioned against equating total sample units that are violative with total violative residues. For example, tissue from one animal analyzed by the Chlorinated Hydrocarbons and Organophosphates screening method may contain two or more violative residues within this compound class.

It should also be noted that many sample tissues are analyzed for more than one compound or compound class and are reported here as separate analyses. Each will be reported and included in total residue findings, even though occurring in the same animal.

In addition, analytical capabilities should be considered when interpreting residue levels and occurrences; see the 1994 edition of the NRPP, Section 3, "FSIS Residue Analytical Capability."

Aggregation of Data:

Care must be taken when making statistical inferences from this data. The domestic monitoring sampling program is designed to detect, with a predetermined level of confidence, specific compounds in the designated slaughter classes. The sampling program is not designed to provide an estimate of an overall national percentage of violations for all chemical residues and slaughter classes tested. The data on violations reported here should not be summed across either slaughter class or compound with the intent of arriving at a combined percentage to estimate a population value. This will not produce a statistically valid estimate for the population, given the sample design in use.

Confidence Intervals:

Within a slaughter class/compound pair, the results of the sampling may be considered as representative of that entire slaughter class population, since the sample selection

procedure is designed to approximate the selection of a simple random sample of animals. Hence, the percentage of violations in each pair is a statistically valid estimate of the corresponding slaughter class population percentage. Therefore, the information presented includes these estimates of percentage of violations, along with appropriate confidence intervals. The two-sided 95% confidence intervals for the population percentage of violations are given (i.e., the probability is approximately 95% that the interval ranging from the lower bound through the upper bound will contain the true population value). The confidence intervals were computed using the binomial distribution.

A Note on Calf Nomenclature

This edition follows the usage of the 1989 and later editions of the NRPP. "Fancy calves" in the 1988 edition became "Formula-fed calves" in 1989; "Western calves" in the 1988 edition became "Heavy calves" in 1989.

Non-violative Positive Results

Appendix II displays, for monitoring and individual enforcement testing (excluding CAST), those laboratory-confirmed residues that are within established limits. The results include some Unidentified Microbial Inhibitors (UMI's), residues from antibacterial agents that are present but cannot be accurately identified.

Voluntary Inspection Program

A voluntary inspection and certification program is maintained for rabbits. Results from 1994 are presented in Appendix III.

RESULTS

1994 Summary

A low incidence of violative monitoring samples was detected in 1994, as has been found in previous sampling years. FSIS data indicate that the great majority of the 131.6 million head of livestock and 7.5 billion birds are free of violative residues when they are slaughtered in federally inspected plants.

In 1994 the FSIS monitoring program sampled and tested for twelve classes of animal drug and pesticide compounds, comprising approximately 42 residues. Of the 38,894 monitoring samples, 70 showed violative concentrations of residues. As noted earlier, the percent violative for all samples and all residues is not necessarily representative of the percent violative in the population as a whole. Sample percents can be considered representative only within a slaughter class/compound pair.

1994 DOMESTIC RESIDUE DATA BOOK

In 1994 monitoring, the following violations were found: 23 sulfonamides, 19 antibiotics, 10 chlorinated hydrocarbons and chlorinated organophosphates, seven ivermectin, six levamisole, five arsenic, and one morantel tartrate.

The majority of these violations detected in monitoring were from illegal levels of approved animal drugs, particularly sulfonamide and antibiotic compounds used to prevent or treat bacterial infections. Most antibiotic and sulfonamide residue violations are confined to a relatively small percentage of livestock and poultry that make up the meat supply. The recurring reason for drug residue violations in livestock and poultry is failure to allow an adequate withdrawal time for the drugs to clear the animal's system. Detected illegal residues are usually concentrated in kidney, liver, or fat rather than muscle meat. NRP monitoring focuses on kidney and liver tissues, since most FDA limits are set in terms of these tissues.

Specific National Residue Program Compounds/Classes

Antibiotics

Nineteen antibiotic monitoring violations were found among 8,354 samples from all slaughter classes monitored for antibiotics. The number of CAST analyses performed on bob veal calves remained almost the same in 1993 and 1994. In 1994 there were 948 violative specimens in the 65,059 CAST samples tested. STOP testing in 1994 for horses, cattle, sheep/lambs, goats, and swine resulted in 1,046 violations among 102,521 sample analyses. FAST testing in 1994 for cattle resulted in 255 violations among 30,343 sample analyses.

Sulfonamides

Twenty-three sulfonamide violations occurred among 8,098 samples from all slaughter classes monitored for sulfonamides. Sows accounted for seven sulfa residue violations. Three sulfa violations each occurred in boars, and young and mature turkeys. The 23 sulfa violations included 13 from sulfamethazine, seven from sulfadimethoxine, two from sulfaquinoxaline, and one from sulfachlorpyridazine. SOS testing produced 104 violative samples of 166,091 analyzed in 1994.

Arsenicals

Arsenical compounds are used in food-producing animals primarily as growth promoters and to prevent bacterial enteritis. Of the 2,223 monitoring samples of livestock and poultry, three violations were detected in young turkeys and two in young chickens.

Chlorinated Hydrocarbons & Organophosphates

These chemicals are effective insecticides. Some of these compounds - such as DDT - are no longer marketed because of their extremely long half-life. 9,109 samples were analyzed, and ten violative analyses were found in sample specimens from non-formula calves, heavy calves, goats, boars/stags, and sows. PCB's accounted for six of the ten violative residues in non-formula calves, goats, boars, and sows. Two DDT violative residues were found in heavy calves and sows.

Halofuginone

Halofuginone prevents coccidiosis, a serious and potentially fatal parasitic infection that spreads rapidly among chickens and turkeys. No violations were found in 629 young turkeys and young chickens sampled in 1994.

Ivermectin

Ivermectin is one of the most widely sold anthelmintic drugs in the United States. It is active against a wide variety of parasites. Seven of 3,926 samples in 1994 monitoring were violative: two in beef cows, two in goats, one in a formula-fed calf, one in a non-formula calf, and one in a heavy calf. No violations were found among samples from eight other production classes.

Levamisole

Levamisole is a broad-spectrum anthelmintic that is active against the mature stages of the major gastrointestinal helminths and against mature and immature lung worms. It is approved for use in swine, non-lactating dairy cattle,and beef cattle. Withdrawal times vary from two to nineteen days before slaughter depending on the slaughter class and dosage regimen. Of the 4,077 samples tested in the 1994 monitoring program, two violations were found in mature sheep and one violation each was found in a beef cow, a lamb, a market hog, and a boar.

Morantel Tartrate

Morantel tartrate is a broad-spectrum anthelmintic used for the removal and control of mature gastrointestinal nematode infections. It is approved for use in dairy and beef cattle. The extensive use of morantel tartrate in dairy cattle was a major factor for including this compound in the plan. One violation from the 2,478 monitoring samples occurred in a beef cow.

1994 DOMESTIC RESIDUE PROGRAM RESULTS

Address for Comments:

The domestic residue sampling programs and its results are designed and compiled by the Residue Staff in the Science and Technology Program. Please contact the Residue Staff for responses to scientific questions about the residue program. The telephone number is 202-205-0007. Significant contributions were made by Tari P. Kindred, DVM, MS, MPH, Former Chief, Residue Staff.

The address is:
FSIS, Science and Technology Program
Residue Staff
300 12th Street, SW, 305 Annex
Washington, D.C. 20250

Residue Staff
Bharat L. Patel, DVM, MS
James R. Walcott, DVM

Scientific Information Branch
JoAnn T. Hicks

Statistical Analysis Branch
Patricia D. Saunders, MS

FSIS welcomes comments regarding this publication addressed to:
Jeffrey L. Brown, Editor
Science and Technology program
FSIS, USDA
300 12th Street, SW
Washington, D.C. 20250

1994 DOMESTIC RESIDUE PROGRAM RESULTS

1994 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS

Chlortetracycline
Erythromycin
Gentamicin
Neomycin
Oxytetracycline
Penicillins
Streptomycin
Tetracycline
Tylosin

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses				2/0
Bulls	406/0	0	0.0-0.9	
Beef cows	527/1	0.2	0.0-1.1	
Dairy cows	424/0	0	0.0-0.9	
Heifers	341/0	0	0.0-1.1	
Steers	339/0	0	0.0-1.1	
Bob calves	455/3	0.7	0.1-1.9	
Formula-fed calves	547/0	0	0.0-0.7	
Non-formula calves	409/1	0.2	0.0-1.4	
Heavy calves	493/1	0.2	0.0-1.1	
Cattle				89/7
Sheep	302/0	0	0.0-1.2	
Lambs	364/2	0.5	0.1-2.0	
Goats	431/0	0	0.0-0.9	15/0
Market hogs	326/4	1.2	0.3-3.1	
Boars/Stags	455/2	0.4	0.1-1.6	
Sows	540/3	0.6	0.1-1.6	

ANTIBIOTICS, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Swine				98/1
Young chickens	499/0	0	0.0-0.7	
Mature chickens	525/0	0	0.0-0.7	
Chickens				7/0
Young turkeys	530/1	0.2	0.0-1.0	
Mature turkeys	258/0	0	0.0-1.4	
Ducks	139/1	0.7	0.0-3.9	
Geese	44/0	0	0.0-8.0	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Beef cows: 1 neomycin
Bob calves: 1 erythromycin, 1 gentamicin, 1 tetracycline
Non-formula calves: 1 oxytetracycline
Heavy calves: 1 erythromycin, 1 penicillin
Lambs: 1 penicillin, 1 streptomycin, 1 tetracycline
Market hogs: 2 chlortetracycline, 1 neomycin, 1 oxytetracycline
Boars/Stags: 1 gentamicin, 1 penicillin
Sows: 3 penicillin
Young turkeys: 1 tetracycline
Ducks: 1 chlortetracycline

Enforcement Testing:

Cattle: 3 erythromycin, 2 gentamicin, 1 neomycin, 2 oxytetracycline, 5 penicillin, 1 streptomycin
Swine: 1 oxytetracycline, 1 tetracycline

1994 DOMESTIC RESIDUE PROGRAM RESULTS

In-plant Tests	Enforcement Testing: Analyses/Violations
Calf Antibiotic and Sulfonamide Test (CAST)	65,059/948
Swab Test On Premises (STOP) [Includes samples tested for sulfonamides]	
Horses	421/13
Cattle	95,248/1,001
Sheep/Lambs	1,028/6
Goats	170/0
Swine	5,654/26
TOTAL STOP	102,521/1,046

STOP SPECIFIC VIOLATIVE RESIDUES

Horses: 8 penicillin, 4 streptomycin, 1 gentamicin
Cattle: 410 penicillin, 250 oxytetracycline, 108 streptomycin, 79 tetracycline, 75 gentamicin, 65 sulfamethazine, 62 sulfadimethoxine, 27 erythromycin, 26 chlortetracycline, 10 neomycin, 3 sulfachlorpyridazine, 2 sulfathiazole, 1 sulfadoxine
Sheep/Lambs: 4 tetracycline, 1 penicillin, 1 streptomycin
Swine: 10 penicillin, 4 tetracycline, 4 sulfamethazine, 3 oxytetracycline, 2 chlortetracycline, 1 erythromycin, 1 neomycin, 1 streptomycin

Fast Antimicrobial Screen Test (FAST) [Includes samples tested for sulfonamides also]	
Cattle	30,332/255
Swine	11/0

FAST SPECIFIC VIOLATIVE RESIDUES

Cattle: 98 penicillin, 62 oxytetracycline, 48 neomycin, 37 tetracycline, 24 gentamicin, 18 chlortetracycline, 18 sulfadimethoxine, 13 streptomycin, 11 sulfamethazine, 6 sulfathiazole, 4 tylosin, 2 erythromycin

1994 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES

Sulfachlorpyridazine
Sulfadimethoxine
Sulfamethazine
Sulfathiazole

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	366/0	0	0.0-1.0	
Beef cows	513/1	0.2	0.0-1.1	
Dairy cows	401/2	0.5	0.1-1.8	
Heifers	343/0	0	0.0-1.1	
Steers	340/0	0	0.0-1.1	
Bob calves	515/1	0.2	0.0-1.1	
Formula-fed calves	520/0	0	0.0-0.7	
Non-formula calves	397/0	0	0.0-0.9	
Heavy calves	463/1	0.2	0.0-1.2	
Cattle				70/56
Sheep	299/0	0	0.0-1.2	
Lambs	363/0	0	0.0-1.0	
Goats	268/0	0	0.0-1.4	15/0
Market hogs	325/1	0.3	0.0-1.7	
Boars/Stags	455/3	0.7	0.1-1.9	
Sows	542/7	1.3	0.5-2.6	
Swine				143/42
Young chickens	506/1	0.2	0.0-1.1	

1994 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Mature chickens	524/0	0	0.0-0.7	
Chickens				5/0
Young turkeys	521/3	0.6	0.1-1.7	
Mature turkeys	259/3	1.2	0.2-3.3	
Turkeys				43/0
Ducks	137/0	0	0.0-2.7	
Geese	41/0	0	0.0-8.6	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Beef cows: 1 sulfadimethoxine
Dairy cows: 2 sulfamethazine
Bob calves: 1 sulfamethazine
Heavy calves: 1 sulfamethazine
Market hogs: 1 sulfamethazine
Boars/Stags: 3 sulfamethazine
Sows: 1 sulfachlorpyridazine, 1 sulfadimethoxine, 5 sulfamethazine
Young chickens: 1 sulfaquinoxaline
Young turkeys: 2 sulfadimethoxine, 1 sulfaquinoxaline
Mature turkeys: 3 sulfadimethoxine

Enforcement Testing:

Cattle: 44 sulfadimethoxine, 12 sulfamethazine, 1 sulfathiazole
Swine: 42 sulfamethazine

SULFA-ON-SITE (SOS)	**Enforcement Testing: Analyses/Violations**
Swine	166,091/104

All residues are of sulfamethazine in muscle tissue.

1994 DOMESTIC RESIDUE PROGRAM RESULTS

ARSENIC

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Goats	165/0	0	0.0-2.2	
Market hogs	324/0	0	0.0-1.1	
Boars/Stags	270/0	0	0.0-1.4	
Sows	337/0	0	0.0-1.1	
Young chickens	305/2	0.7	0.1-2.3	
Mature chickens	320/0	0	0.0-1.1	
Chickens				34/0
Young turkeys	334/3	0.9	0.2-2.6	
Mature turkeys	168/0	0	0.0-2.2	
Turkeys				32/1

1994 DOMESTIC RESIDUE PROGRAM RESULTS

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Aldrin
Benzene Hexachloride (BHC)
Carbophenothion (trithion)
Chlordane (technical)
2-Chloro-1(2,4,-dichlorophenyl)vinyl diethyl phosphate [chlorfenvinphos, supona]
2-Chloro-2,4,5 trichlorophenyl)vinyl dimethyl phosphate [stirofos, gardona]
Chlorpyrifos
Coumaphos and oxygen analog
DDT and metabolites
Dieldrin
Dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)pentalene [mirex]
Endosulfan
Endrin
Heptachlor and heptachlor epoxide
Hexachlorobenzene (HCB)
Lindane
Linuron
Methoxychlor
Phosalone
Polybrominated biphenyls
Polychlorinated biphenyls

(Non-violative positive are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	217/0	0	0.0-1.7	
Bulls	572/0	0	0.0-0.6	
Beef cows	534/0	0	0.0-0.7	
Dairy cows	402/0	0	0.0-0.9	
Heifers	550/0	0	0.0-0.7	
Steers	532/0	0	0.0-0.7	
Formula-fed calves	514/0	0	0.0-0.7	
Non-formula calves	371/2	0.5	0.1-1.9	
Heavy calves	480/2	0.4	0.0-1.5	
Cattle				30 /0
Sheep	463/0	0	0.0-0.8	
Lambs	572/0	0	0.0-0.6	

1994 DOMESTIC RESIDUE PROGRAM RESULTS

CHC/COP'S, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Goats	437/2	0.5	0.1-1.6	30/0
Market hogs	504/0	0	0.0-0.7	
Boars/Stags	433/2	0.5	0.1-1.7	
Sows	538/1	0.2	0.0-1.0	
Swine				30/0
Young chickens	504/0	0	0.0-0.7	
Mature chickens	524/0	0	0.0-0.7	
Young turkeys	526/0	0	0.0-0.7	
Mature turkeys	253/0	0	0.0-1.4	
Ducks	139/0	0	0.0-2.6	
Geese	44/0	0	0.0-8.0	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Non-formula calves: 2 PCB
Heavy calves: 1 mirex, 1 DDT
Goats: 2 PCB
Boars/Stags: 1 BHC, 1 PCB
Sows: 1 DDT, 1 PCB

Enforcement Testing:

None

HALOFUGINONE

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Young chickens	309/0	0	0.0-1.2	10/0
Young turkeys	320/0	0	0.0-1.1	

IVERMECTIN

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Beef cows	317/2	0.6	0.1-2.3	
Dairy cows	256/0	0	0.0-1.4	
Heifers	351/0	0	0.0-1.0	
Steers	332/0	0	0.0-1.1	
Formula-fed calves	319/1	0.3	0.0-1.7	
Non-formula calves	233/1	0.4	0.0-2.4	
Heavy calves	291/1	0.3	0.0-1.9	
Cattle				6/0
Sheep	296/0	0	0.0-1.2	
Lambs	357/0	0	0.0-1.0	
Goats	254/2	0.8	0.1-2.8	
Market hogs	309/0	0	0.0-1.2	

IVERMECTIN, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Boars/Stags	282/0	0	0.0-1.3	
Sows	329/0	0	0.0-1.1	
Swine				1/0

LEVAMISOLE

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	375/0	0	0.0-1.0	
Beef cows	329/1	0.3	0.0-1.7	
Dairy cows	229/0	0	0.0-1.6	
Heifers	345/0	0	0.0-1.1	
Steers	340/0	0	0.0-1.1	
Formula-fed calves	325/0	0	0.0-1.1	
Heavy calves	294/0	0	0.0-1.2	
Sheep	294/2	0.7	0.1-2.4	
Lambs	358/1	0.3	0.0-1.5	
Sheep/Lambs				49/3
Goats	266/0	0	0.0-1.4	

LEVAMISOLE, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Market hogs	314/1	0.3	0.0-1.8	
Boars/Stags	279/1	0.4	0.0-2.0	
Sows	329/0	0	0.0-1.1	
Swine				10/0

MORANTEL TARTRATE

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	360/0	0	0.0-1.0	
Beef cows	405/1	0.2	0.0-1.4	
Dairy cows	251/0	0	0.0-1.5	
Heifers	351/0	0	0.0-1.0	
Steers	249/0	0	0.0-1.5	
Formula-fed calves	326/0	0	0.0-1.1	
Non-formula calves	242/0	0	0.0-1.5	
Heavy calves	294/0	0	0.0-1.2	

1994 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses
Horses	217	2
Bulls	2,079	
Beef cows	2,625	
Dairy cows	1,963	
Heifers	2,281	
Steers	2,132	
Bob calves	970	
Formula-fed calves	2,551	
Non-formula calves	1,652	
Heavy calves	2,315	
Cattle		195
Sheep	1,654	
Lambs	2,014	
Sheep/Lambs		49
Goats	1,821	60
Market hogs	2,102	
Boars/Stags	2,174	
Sows	2,615	
Swine		282
Young chickens	2,123	
Mature chickens	1,893	
Chickens		56
Young turkeys	2,231	
Mature turkeys	938	

1994 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL, continued

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses
Turkeys		75
Ducks	415	
Geese	129	
TOTAL	38,894	719

CUMULATIVE TOTAL

Compound Class	Monitoring: Analyses	Enforcement Testing: Analyses
Antibiotics	8,354	198,123[1]
Sulfonamides	8,098	166,367[2]
Arsenic	2,223	66
CHC/COP's	9,109	90
Halofuginone	629	10
Ivermectin	3,926	7
Levamisole	4,077	59
Morantel tartrate	2,478	
TOTAL	38,894	364,722

[1] Includes CAST, FAST, and STOP data.
[2] Includes SOS data.

1994 DOMESTIC RESIDUE PROGRAM RESULTS

STATISTICAL TABLE: NUMBER OF SAMPLES REQUIRED TO ENSURE DETECTION OF A PROBLEM THAT AFFECTS A GIVEN PERCENTAGE OF THE SAMPLED POPULATION

Percentage Violative in Sampled Population	Probability of Detection (Percent)			
	90	**95**	**99**	**99.9**
		Samples Required		
10	22	29	44	66
5	45	59	90	135
1	230	299	459	688
0.5	460	598	919	1,379
0.1	2,302	2,995	4,603	6,905
0.05	4,605	5,990	9,209	13,813

APPENDIX I

RESIDUE LIMITS FOR COMPOUNDS INCLUDED IN THE 1994 DOMESTIC RESIDUE PROGRAM

APPENDIX I: 1994 RESIDUE LIMITS

This section provides information on residue limits in meat and poultry products applied by FSIS (as of July 1, 1994). These limits include tolerances and action levels developed by the Environmental Protection Agency (EPA) for pesticide chemicals, and by the Food and Drug Administration (FDA) for animal drugs and unavoidable contaminants. These limits are derived in most cases from the Code of Federal Regulations (CFR): pesticide limits from 40 CFR 180, those for animal drugs from 21 CFR 556, and unavoidable contaminants from 21 CFR 109. The approved use conditions for animal drugs can be found in 21 CFR 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for use with animals), and 558 (new animal drugs for use in animal feed).

Formal tolerances are not established in all cases. For example, tolerance exemptions have been granted by EPA and FDA in approving the use of some pesticides and new animal drugs. For some unavoidable contamination situations, EPA and FDA, upon request, recommend action levels to FSIS; however, tolerances or action levels have not been established for all such situations. FSIS permits concentrations of residues in meat and poultry that do not exceed the residue limits published in this section.

The residue limits for poultry and livestock species are listed alphabetically by compound (which may include a compound's metabolites). The entries include, among other things, CFR or Federal Register (FR) citations for tolerances, and notations of action levels. Entries for animal drugs with "zero" or "no residue" tolerances also include, in parenthesis, the limits of quantification determined by FSIS in applying the pertinent method. These limits are used by FDA for enforcement purposes, and are applied by FSIS in determining if product is adulterated.

Any residue of a new animal drug found in the edible tissues of a species for which the drug is not approved will be considered an adulterant, provided the residue is found at a concentration that can be quantified and confirmed by a validated analytical method. A concentration of a substance endogenous in the animal tissue in question would not be considered an adulterant.

Unless otherwise indicated, "meat byproducts" includes kidney and liver.

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry
ANTIBIOTICS					
Chlortetracycline	21 CFR 556.150	0.0F[1] 0.1K[1] 0.1L[1] 0.1M[1]	0.2F 1K[2] 0.5L[2] 0.1M[2]	1F 4K 2L 1M	- 4K 1L 1M, 1S
Erythromycin	21 CFR 556.230	0.1Et	-	0.1Et	0.125Et
Gentamicin	21 CFR 556.300	-	-	0.4F 0.4K 0.3L 0.1M	0.1Et[3]
Neomycin	21 CFR 556.430 21 CFR 522.1484 21 CFR 524.1484	0.25Et[4] 1.00F[5] 0.75K[5] 0.50L[5] 0.25M[5]	- 1.25F[5] 1.25K[5] 1.25L[5] 0.25M[5]	- 1.00F[5] 1.00K[5] 0.75L[5] 0.25M[5]	- 0.50F[5] 1.00K[5] 0.75L[5] 0.25M[5]
Oxytetracycline	21 CFR 556.500 21 FR 42855	0.1Et	0.1 Et	0.1Et	1F 3K 1L 1M, 1S
Penicillin	21 CFR 556.510	0.05Et	0(0.04)Et[6]	0(0.04)Et[6]	0(0.04)Et[6,7]
Streptomycins	21 CFR 556.200 21 CFR 556.610	2K 0.5Et	-	2K 0.5Et	2K 0.5Et

1 Cattle only; calves 1F, 4K, 4L, 1M.
2 Sheep only.
3 Turkeys only.
4 Calves only.
5 Action level (letter from J. Taylor of FDA to L. Crawford of FSIS, January 26, 1988).
6 Numbers in parenthesis are minimum levels of detection.
7 Chickens, pheasants, and quail; turkeys 0.01 Et; ducks and geese 0.01Et (action level).

KEY

Ek:Excluding Kidneys
Et:Edible tissue
F:Fat
K:Kidney
L: Liver
M:Muscle
Mb:Meat byproducts
S:Skin
Sf:Skin with fat
Sm:Skeletal muscle

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry
ANTIBIOTICS, continued					
Tetracycline	21 CFR 556.720	0.25Et[1]	0.25Et	0.25Et	0.25Et
Tylosin	21 CFR 556.740	0.2F 0.2K 0.2L 0.2M	-	0.2F 0.2K 0.2L 0.2M	0.2F 0.2K 0.2L 0.2M
SULFONAMIDES					
Sulfachlorpyridazine	21 CFR 556.630	0.1Et[1]	-	0.1Et	-
Sulfadimethoxine	21 CFR 556.640	0.1Et	-	-	0.1Et
Sulfaethoxypyridazine	21 CFR 556.650	0.1Et	-	0.(0.1)Et[2]	-
Sulfamethazine	21 CFR 556.670	0.1Et	-	0.1Et	0.1Et[3]
Sulfathiazole	21 CFR 556.690	-	-	0.1Et	-
ARSENICALS	21 CFR 556.60 40 CFR 180.311	0.7F[4] 1.4K[4] 1.4L[4] 0.7M[4] 0.7Mb[4]	-	2K 2L 0.5M 0.5Mb	0.5M 2Mb

1 Calves only.
2 Numbers in parenthesis are minimum levels of detection.
3 Chickens and turkeys.
4 Cacodylic acid (as AS_2O_3).

KEY

EK:Excluding kidneys
Et:Edible tissue
F:Fat
K:Kidney
L:Liver
M:Muscle
Mb:Meat
S:Skin
Sf:Skin with fat
Sm:Skeletal muscle

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)						
Aldrin[1]	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F
Benzene Hexachloride[1] (BHC)	51 FR 25697	0.3F	0.3F	0.3F	0.3F	0.3F
Carbophenothion	40 CFR 180.156	0.1F	0.1F	0.1F	-	-
Chlordane[2]	51 FR 46665	0.3F	0.3F	0.3F	0.3F	0.3F
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate [chlorfenvinphos]	40 CFR 180.322	0.2F	0.2F[3]	0.005F	0.005F	0.005F
2-Chloro-1-(2,4,5-tri-chlorophenyl)vinyl diethyl phosphate [stirofos]	40 CFR 180.252	1.5F	0.5F	1.5F	0.075F	0.5F
Chlorpyrifos and metabolite	40 CFR 180.342 58 FR 19356	0.3F 0.05M 0.05Mb	0.2F 0.05M 0.05Mb	0.2F 0.05M 0.5Mb	0.1F 0.1M 0.1Mb	0.25F 0.25M 0.25Mb
Coumaphos and oxygen analog	40 CFR 180.189	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb

1 Action level.
2 Action level; includes sum of residues of cis- and trans-chlordane, cis- and trans-nonachlor, oxychlordane (octachlor epoxide), and alpha, beta, and gamma chlordene.
3 Sheep only; goats 0.005F.

KEY

EK:Excluding kidneys
Et:Edible tissue
F:Fat
K:Kidney
L:Liver
M:Muscle
Mb:Meat byproducts
S:Skin
Sf:Skin with fat
Sm:Skeletal muscle

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHC/COP'S, continued						
DDT and metabolites[1]	51 FR 46658	5F	5F	5F	5F	5F
Dieldrin[1]	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F
Dodecachloroocta-[1] hydro-1,3,4-metheno-2H-cyclo-buta(cd) pentalene [Mirex]	51 FR 45114	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Endosulfan and metabolite	40 CFR 180.182	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M		0.2F 0.2M 0.2Mb
Hexachlorobenzene[1] (HCB)	MPI Dir 917.1	0.5F	0.5F	0.5F	0.5F	0.5F
Heptachlor and[1] heptachlor epoxide	54 FR 33690 MPI Dir 917.1	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Lindane	40 CFR 180.133 MPI Dir 917.1	7F	7F	4F	4F[1]	7F

1 Action level.

KEY

Ek:Excluding kidneys	M: Muscle
Et:Edible tissue	Mb:Meat byproducts
F:Fat	S:Skin
K:Kidney	Sf:Skin with fat
L:Liver	Sm:Skeletal muscle

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHC/COP'S, continued						
Linuron	40 CFR 180.184	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	-	1F 1M 1Mb
Methoxychlor	40 CFR 180.120 MPI Dir. 917.1	3F	3F	3F	3F[1]	3F
Polychlorinated biphenyls (PCB's)[2]	21 CFR 109.30 46FR 39224	3F[1]	3F[1]	3F[1]	3F	3F[1]
Phosalone	40 CFR 180.263	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	-	0.25F 0.25M 0.25Mb
HALOFUGINONE	21 CFR 556.308	-	-	-	0.16L[3] 0.13L[3]	-

1. Action level.
2. The temporary tolerance for unavoidable residues of PCB's in infant and junior foods 0.2ppm.
3. Broiler chickens and turkeys respectively; tolerance for parent halofuginone; corresponds to 0.3 ppm total residues in liver.

KEY

Ek:Excluding kidneys
Et:Edible tissue
F:Fat
K:Kidney
L:Liver
M:Muscle
Mb:Meat byproducts
S:Skin
Sf:Skin with fat
Sm:Skeletal muscle

APPENDIX I: 1994 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry
IVERMECTIN	21 CFR 556.344	100L[1]	30L[2]	20L[3]	-
LEVAMISOLE	21 CFR 556.350	0.1Et	0.1Et[4]	0.1Et	-
MORANTEL TARTRATE	21 CFR 556.425	0.7L[5]	-	-	-

1. Tolerance in ppb for 22,23-dihydroavermectin B1a; corresponds to 240 ppb total residues in liver.
2. Sheep only; tolerance in ppb for 22,23-dihydroavermectin B1a.; corresponds to 125 ppb total residues in liver.
3. Tolerance in ppb for 22,23-dihydroavermectin B1a ; corresponds to 75 ppb total residues in liver.
4. Sheep only.
5. Tolerance for marker residue N-methyl-1,3, propanediamine (MAPA); corresponds to 2.4 ppm total residue in liver.

KEY

Ek: Excluding kidneys
Et: Edible tissue
F: Fat
K: Kidney
L: Liver
M: Muscle
Mb: Meat by products
S: Skin
Sf: Skin with fat
Sm: Skeletal muscle

APPENDIX II

1994 DOMESTIC RESIDUE PROGRAM RESULTS

NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

This page intentionally left blank.

APPENDIX II: 1994 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

ANTIBIOTICS

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Horses		2/0
Bulls	406/0	
Beef cows	527/2	
Dairy cows	424/0	
Heifers	341/0	
Steers	339/0	
Bob calves	455/2	
Formula-fed calves	547/7	
Non-formula calves	409/1	
Heavy calves	493/1	
Cattle		89/1
Sheep	302/0	
Lambs	364/0	
Goats	431/0	15/0
Market hogs	326/7	
Boars/Stags	455/5	
Sows	540/0	
Swine		98/15
Young chickens	499/0	
Mature chickens	525/1	
Chickens		7/0
Young turkeys	530/3	
Mature turkeys	258/4	
Ducks	139/0	
Geese	44/0	

APPENDIX II: 1994 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

SULFONAMIDES

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	366/0	
Beef cows	513/1	
Dairy cows	401/0	
Heifers	343/4	
Steers	340/0	
Bob calves	515/3	
Formula-fed calves	520/1	
Non-formula calves	397/2	
Heavy calves	463/5	
Cattle		70/5
Sheep	299/0	
Lambs	363/0	
Goats	268/0	15/0
Market hogs	325/1	
Boars/Stags	455/7	
Sows	542/3	
Swine		143/26
Young chickens	506/1	
Mature chickens	524/0	
Chickens		5/0
Young turkeys	521/7	
Mature turkeys	259/7	
Turkeys		43/4
Ducks	137/0	
Geese	41/0	

APPENDIX II: 1994 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

ARSENIC

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Cattle		1/1
Goats	165/134	
Market hogs	324/100	
Boars/Stags	270/75	
Sows	337/111	
Young chickens	305/275	
Mature chickens	320/132	
Chickens		34/32
Young turkeys	334/184	
Mature turkeys	168/83	
Turkeys		32/27

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Horses	217/15	
Bulls	572/71	
Beef cows	534/64	
Dairy cows	402/60	
Heifers	550/28	
Steers	532/21	
Formula-fed calves	514/23	
Non-formula calves	371/51	
Heavy calves	480/70	
Cattle		30/8
Sheep	463/89	

CHC/COP'S, continued

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Lambs	572/57	
Goats	437/100	30/2
Market hogs	504/24	
Boars/Stags	433/56	
Sows	538/57	
Swine		30/2
Young chickens	504/6	
Mature chickens	524/3	
Young turkeys	526/14	
Mature turkeys	253/5	
Ducks	139/0	
Geese	44/4	

HALOFUGINONE

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Young chickens	309/2	10/0
Young turkeys	320/2	

APPENDIX II: 1994 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

IVERMECTIN

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Beef cows	317/2	
Dairy cows	256/0	
Heifers	351/1	
Steers	332/0	
Formula-fed calves	319/5	
Non-formula calves	233/3	
Heavy calves	291/1	
Cattle		6/1
Sheep	296/2	
Lambs	357/1	
Goats	254/0	
Market hogs	309/1	
Boars/Stags	282/1	
Sows	329/4	
Swine		1/0

LEVAMISOLE

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	375/0	
Beef cows	329/0	
Dairy cows	229/0	
Heifers	345/0	
Steers	340/0	
Formula-fed calves	325/0	
Heavy calves	294/0	

LEVAMISOLE, continued

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Sheep	294/1	
Lambs	358/0	
Sheep/Lambs		49/1
Goats	266/0	
Market hogs	314/0	
Boars/Stags	279/1	
Sows	329/0	
Swine		10/0

MORANTEL TARTRATE

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	360/0	
Beef cows	405/0	
Dairy cows	251/0	
Heifers	351/0	
Steers	249/0	
Formula-fed calves	326/1	
Non-formula calves	242/0	
Heavy calves	294/0	

APPENDIX III

APPENDIX III. 1994 VOLUNTARY INSPECTION AND CERTIFICATION PROGRAM FOR RABBITS

Monitoring:	Analyses/ Violations	Analyses/ Non-violative Positives
Antibiotics	34/0	34/8
Sulfonamides	32/0	32/0
CHC/COP'S	33/0	33/2